Assignment - 1

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***Abstract*—This document contains the solution to Exercise 2.28 (b) of Oppenheim.**

Problem 1. Determine if the given signal, $x[n] = sin(\pi n/19)$, is periodic, if yes determine it's period.

Solution: since the given signal is a sinusoidal function hence it's periodic.

$$x[n+38] = sin(\pi\frac{(n+38)}{19}) \tag{1}$$

$$sin(\pi\frac{(n+38)}{19}) = sin(\pi\frac{n}{19} + 2\pi) \tag{2}$$

$$sin(\pi\frac{n}{19} + 2\pi) = sin(\pi\frac{n}{19}) = x[n] \tag{3}$$

$$\therefore x[n+38] = x[n] \tag{4}$$

$\therefore$ the period is 38, as the sine funtion is periodic with period 2π.

Alternatively, We know that the sine and cosine waves period can be obtained by $\omega = \frac{2.\pi}{B}$, where B is coefficient of the variable term in the sine function

$$\omega = \frac{2.\pi}{\pi/19} = \frac{2.19.\pi}{\pi} = 38 \tag{5}$$

Hence, the signal is periodioc with period 38.